

AMERICAN MUSEUM NOVITATES

Published by
Number 1307 THE AMERICAN MUSEUM OF NATURAL HISTORY January 14, 1946
New York City

ANNOTATED FAUNAL LIST OF THE GLEN DEAN FORMATION OF CRANE, INDIANA¹

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INTRODUCTION

The study of the fossils collected at Crane, Indiana, having been completed, publication of a comprehensive faunal list of the Glen Dean formation in that part of southwestern Indiana appears to be desirable.

By way of introduction, a few words on the localities and their stratigraphy might be expedient. Collections were made at several localities, most of them deserted quarries within a perimeter of from one-half to two-thirds of a mile around the road junction called Sargent's Corner (about 2½ miles due south of the east end of Lake Greenwood) in Martin County, Indiana. These quarries were assigned the numbers I and Ia, both of them northwest, and II, IIa, IIb, and IIc, all southwest of Sargent's Corner, respectively. One more locality, called "III," is about 1½ miles southwest of that point, directly across the

road from the South Transfer Depot of the Naval Ammunition Depot at Crane. The elevation of all these localities is between 550 and 700 feet above sea level.

The Glen Dean, which is the top formation of the Middle Chester or, to use a new term introduced by J. M. Weller and A. H. Sutton (1940), of the Homberg group, attains in these localities thicknesses up to 40 or 50 feet. It consists chiefly of limestone, with some interbedded shales in the lower portion of the formation, whereas it assumes a dense, cherty facies in its uppermost layers. The formation overlies the Hardingsburg sandstone and is conformably overlain by the plant bearing Tar Springs sandstone, basal formation of the Upper Chester (Elvira group). Except for a slight dip toward the south or southwest, the strata appear to be flat and undisturbed throughout the area.

FAUNAL LIST

Faunistically, slight differences are found between the various localities, certain groups of fossils being more abundant in one than in the other. On the whole, however, the formation may be considered a faunistic as well as a stratigraphic unit throughout the area. Therefore, no differentiation as to localities is made in the following faunal list. Forms particularly common, which thus may serve as index fossils for the formation in that area, are preceded by a "c," those particularly rare by an "r"; these symbols should, however, be understood in a relative sense, indicating

the abundance or rarity, respectively, of certain forms within the major group rather than within the fauna as a whole.

ANTHOZOA

TRIPLOPHYLLITES EASTON

c *T. spinulosus* (Milne Edwards and Haime)

VERMES

SPIROBIS DAUDIN

S. annulatus Hall ?

BLASTOIDEA

PENTREMITES SAY

This genus, as represented at the localities concerned, has been explicitly discussed in Haas, 1945a.

¹ Third report on the results of the writer's collecting trip to Crane, Indiana, in October, 1944; for the first and second reports see American Museum Novitates nos. 1289 and 1302.

The forms recognized are here enumerated merely for the sake of uniformity.

- c *P. spicatus* Ulrich, forma typica
- P. spicatus* Ulrich, var. *porrecta* Haas
- r *P. spicatus* Ulrich, var. *altipelvis* Haas
- r *P. cherokeeus* Hall
- P. elegans* Lyon
- P. pyramidatus* Ulrich
- P. okavensis* S. Weller
- c *P. lyoni* Ulrich, forma typica
- c *P. lyoni* Ulrich, var. *gracilens* Ulrich
- P. brevis* Ulrich
- r *P. cf. brevis* Ulrich
- r *P. hambachi* Butts?
- P. spec. indet.*

One of the specimens here included (A.M.N.H. No. 26071:1) shows clearly the hydrospires; another (on large slab A.M.N.H. No. 26167) has the pinnules preserved.

CRINOIDEA

ZEACRINITES TROOST

- r *Z. wortheni* (Hall)
- Calyx with stalk.

THOLOCRINUS KIRK

- r *T. spec.*

Crushed ventral sac of an unusually large individual¹ (A.M.N.H. No. 26076).

AGASSIZOCRINUS OWEN AND SHUMARD

- r *A. spec.*
- Infrabasal cones.

Crinoidea, genus and spec. indet.

Stems, fragments and links thereof, the first including some unusually long (up to 15 cm.) ones, one of them twisted.

ECHINOIDEA

Genus and spec. indet.

Detached spines.

¹ After completion of the present manuscript an otherwise very similar but much larger head of *Tholocrinus* from quarry "Ia," measuring about 75 mm. in height and about 90 mm. in width, was sent in and generously presented to the American Museum of Natural History by Lieut. W. N. Dale. Whereas the individual listed above might well be conspecific with the specimens of *T. wetherbyi* Wachsmuth and Springer figured by Springer (1926, pl. 25, figs. 4-12), the one here dealt with (A.M.N.H. No. 26198) seems such a giant, when compared with those figures, that it may have to be referred to an independent species.

BRYOZOA

BATOSTOMELLA ULRICH

- B. nitidula* Ulrich

STENOPORA LONSDALE

- S. tuberculata* (Prout)
- S. cestriensis* Ulrich
- r *S. ramosa* Ulrich
- S. spec.*

ANISOTRYPA ULRICH

- r *A. ? spec.*

This form, represented by a single well-preserved colony only, might be the Chester species growing in hollow branches, mentioned but not described or figured by Ulrich (1890, p. 448). Even its generic reference remains, however, doubtful; no ridges can be seen between the openings which are about twice as large as in *A. solida* Ulrich.

LIOCLEMA ULRICH

- r *L. cf. araneum* Ulrich

The three colonies found in the present material deviate from Ulrich's (1890, p. 431, pl. 75, fig. 9-9c) merely by having only six to eight instead of nine to 10 zooecia on a width of 2 mm. The apertures may be subcircular in shape as well as oval, as stated in Ulrich's description, but to judge by his figure 9 this is equally true for his type.

ERIDOPORA ULRICH

- c *E. macrostoma* Ulrich

One colony (on slab A.M.N.H. No. 26130), selected as hypotype, is remarkable for its strong resemblance to Ulrich's protograph (1882, pl. 6, fig. 2).

- r *E. punctifera* Ulrich

FENESTRELLINA D'ORBIGNY (= FENESTELLA AUCTIONE)

Pending Condra and Elias' application to the International Commission on Zoological Nomenclature for the retention of the generic name *Fenestella* Lonsdale, not Bolton (see Condra and Elias, 1941;

1944, p. 18), the name *Fenestrellina* is here used for the forms concerned, as suggested by Bassler. This, however, solves only the formal nomenclatorial problem. Even more complex is the other, which is biological as well as taxonomic and which results from the fact, emphasized in an earlier report (Haas, 1945b, p. 4), that in the Chester series bryozoan meshworks, conspecific with each other, are found radiating from *Archimedes* screws as well as in the appearance of foliate expansions without any connection with such screws. According to McFarlan (1942, p. 444) "the bulk of Fenestellid fronds so common in Chester limestones" has to be referred "to the genus *Archimedes*" and "only *F. cestriensis* and *F. exigua*" are recognized by him "as true *Fenestrellina* with any degree of certainty." Condra and Elias (1944, p. 61), on the other hand, take the following attitude: "... since several American species of *Fenestella* are encrusted by essentially the same fibrous tissue as observed in *Archimedes* and no screws have been found with them, and because some *Archimedes* screws are found as superstructures upon *Fenestella* zoaria, only the fronds of *Fenestella* type attached to flanges of a screw or reasonably proved to be their broken portions—but not when they belong to *Fenestella* colony which served as its base—should be classified as *Archimedes*. In doubtful cases the fragments of *Fenestella* types should be placed rather in the genus *Fenestella* than in *Archimedes*." This recommendation has been followed in the course of the present study.

c *F. cf. cestriensis* (Ulrich)

The specimens from Crane differ from Ulrich's (1890, p. 597) original description by having from 12 to 16—instead of an average of 10—fenestrules to 1 cm.

F. tenax (Ulrich)

F. serratula (Ulrich)

F. spec.

ARCHIMEDES (LESUEUR) OWEN

Observations on some remarkable specimens of this genus from Crane and on the genus as such were published in an earlier report (Haas, 1945b). Here follows the enumeration of the various forms recognized in the present material.

c *A. invaginatulus* Ulrich

A. invaginatulus Ulrich, var.

A single short screw fragment (A.M.N.H. No. 26097), distinguished by extraordinarily wide flanges, attaining up to 15 mm. in diameter, and by having only two (instead of 3.7–5) volutions to 2 cm.

A. swallowanus Hall

An almost perfectly straight screw (A.M.N.H. No. 26099:1), exhibiting 26 volutions, but still incomplete, attains 115 mm. in length.

A. cf. swallowanus Hall

Some microstructural characters of the frond (studied on reverse side only) deviate somewhat from Ulrich's (1890, p. 574) description.

r *A. lativolvus* Ulrich

A short screw fragment (A.M. N.H. No. 26101:2) referred to this species is remarkable for showing on the reverse surface of the flange of its lower volution an almost complete pillar and the stumps, or at least traces, of 10 more which are partly or entirely broken off. Another short screw fragment (A.M. N.H. No. 26168) exhibits a height of the only volution observable of as much as 5 mm., and its upper flange is extraordinarily expanded on one side so as to reach a diameter of almost 20 mm. Even disregarding this extraordinary expansion, the flange still measures nearly 15 mm. in diameter. For both these deviations from the dimensions hitherto observed in the screws of *A. lativolvus*, this fragment is only doubtfully referred to Ulrich's species. Both the fragments here discussed

show excellently the fine striation of the fibrous tissue as discussed (pp. 30-33) and repeatedly illustrated (pl. 2, fig. 2, pl. 3, fig. 2, pl. 4, fig. 7, pl. 6, figs. 1-3, pl. 11, figs. 4-7, pl. 37, fig. 3) by Condra and Elias, 1944.

A. intermedius Ulrich, emend. McFarlan

A. terebriformis Ulrich

r *A. meekanus* Hall

A. meekanoides McFarlan

A. macfarlani Condra and Elias

All the screws from Crane referred to this species resemble Ulrich's (1890, pl. 63) figure 11b much more closely than his figure 11, which is, however, designated the holotype by Condra and Elias (1944, p. 150).

A. distans Ulrich

Hypotype (A.M.N.H. No. 26108) remarkable for its close resemblance to the specimen depicted by Ulrich (1890, pl. 63) in figure 9b, designated lectotype by Condra and Elias (1944, p. 117).

r *A. distans* Ulrich, var.

The few specimens referred to this unnamed variety, all of them on the two large slabs A.M.N.H. Nos. 26166 and 26167, deviate from the typical form of this species merely by their far more tender screws, with three volutions to a length of 1 cm. (instead of 2 cm., as in the former).

r *A. lazus* Ulrich ?

Only one rather scanty fragment is doubtfully referred to this species.

A. spec.

POLYPORE M'COY

P. cestriensis Ulrich

P. tuberculata Prout

r *P. spinulifera* Ulrich

P. spec.

SEPTOPORA PROUT

r *S. subquadrans* Ulrich

Among the few specimens referable to this species a foliate, slightly wrinkled expanse from quarry "Ia" (A.M.N.H. No. 26115:1) is remarkable for its size; as preserved, it

attains approximately 12 cm. in length and 9 cm. in width.

S. cestriensis Prout

RHOMBOPORA MEEK

c *R. armata* Ulrich

A bifurcating branch of particularly fine preservation (on slab



Fig. 1. *Rhombopora armata* Ulrich, hypotype, on slab A.M.N.H. No. 26150. Glen Dean limestone. Locality "III," Crane, Martin County, Indiana. Photomicrograph, \times ca. 5. Lowest part of specimen not seen in photomicrograph. Note paired arrangement of spines, chiefly on main stem; some spines visible in profile.

A.M.N.H. No. 26150) is selected as hypotype and shown in figure 1.¹

c *R. minor* Ulrich

r *R. tabulata* Ulrich

R. tenuirama Ulrich

R. spec.

STREBLOTRYPA ULRICH

S. nicklesi Ulrich

The hypotype, a Y-shaped branch on slab A.M.N.H. No. 26154, is excellently preserved and, therefore, shown in figure 2.¹

PRISMOPORA HALL

r *P. serrulata* Ulrich

BRACHIOPODA

ORTHOTETES FISCHER

r *O. kaskaskiensis* (McChesney)

One of the few specimens present (A.M.N.H. No. 26175) approaches in the character of ornamentation the one figured by S. Weller (1914, pl. 6, fig. 15) under the designation *O. kaskaskiensis* (?).

¹ For permission to use the facilities of the Geological Department of Columbia University for these photomicrographs, which were painstakingly taken by Mrs. Catherine S. Seymour, I am greatly indebted to Profs. Marshall Kay and H. N. Coryell.



Fig. 2. *Streblotrypa nicklesi* Ulrich, hypotype, on slab A.M.N.H. No. 26154. Glen Dean limestone. Locality "III," Crane, Martin County, Indiana. Photomicrograph, \times ca. 10. Unfortunately the half-tone does not show the small pores surrounding the zooecial apertures as distinctly as does the original photomicrograph.

LINOPRODUCTUS CHAO

Found in quarries "II" and "IIc" only.

L. ovatus (Hall)¹

S. Weller's (1919, p. 132, pl. 16, figs. 1-15) conception of this species is here followed; accordingly *L. pileiformis* (McChesney) is considered a synonym of Hall's species.

L. ovatus (Hall), var. ? (A.M.N.H. No. 26178)

In a ventral valve otherwise agreeing with the typical specimens referred to *L. ovatus*, the width is only slightly more than two-thirds of its convexity, as compared to a ratio of six to five according to S. Weller's (1914, p. 133) measurements. The same extremely narrow shape is found in a considerably smaller, incomplete ventral valve. However, it cannot be safely excluded that this deviation in shape might be due only to crushing.

DIAPHRAGMUS Girty

D. elegans (Norwood and Pratten)

A few specimens have not only spine bases, as mentioned by Weller (1914, p. 137), but well-developed, though fine spines preserved on the postero-lateral slopes of the ventral valves.

¹ Quoted as *Productus ovatus* Hall in previous literature.

STENOSCISMA CONRAD²

S. explanata (McChesney)

Found in quarries "I" and "IIc" only.

DIELASMA KING

r. D. shumardanum (Miller)

A single specimen present.

SPIRIFERINA D'ORBIGNY

S. transversa (McChesney)

RETICULARIINA FREDERICKS

*c. R. spinosa*³ (Norwood and Pratten)

Two specimens (A.M.N.H. No. 26184/1) are worth mentioning for having the sinus of the ventral valve, or at least its posterior part, marked by a straight row of spines along the median line.

SPIRIFER SOWERBY

S. increbescens Hall, var.

This characteristic species is represented at Crane by the smaller and more delicate variety stated by Weller (1920, pp. 374-375) to be characteristic of the Lower and Middle Chester faunas, even apparently full grown shells in the present material never exceeding 18 mm. in length and 25 mm. in width, as compared to lengths of 31 and 28 mm., respectively, and widths of 40 and 44 mm., respectively, recorded by Weller (1914, p. 343) for typical shells of this species, as occurring in the Upper Chester. That author (1920, p. 374) points out that "in much of the past literature the name *S. increbescens* has been applied to all of these shells in the Chester faunas." The form listed under this name by Ulrich (1917, p. 229, No. 130) from all of his Glen Dean localities may, therefore, well be the same as that occurring at Crane.

TORYNIFER HALL AND CLARKE

*T. setiger*⁴ (Hall)

² Antedates *Camarophoria* King, mostly quoted "*Camarophoria*" in previous literature.

³ Mostly quoted as *Spiriferina spinosa* in previous literature.

⁴ Mostly quoted as *Reticularia setigera* in previous literature.

CLEIOTHYRIDINA BUCKMAN

c *C. sublamellosa* (Hall)r *C. sublamellosa* (Hall), var. (A.M.N.H. Nos. 26190, 26190/1)

Deviates from the typical form by its unusual width, amounting to about five-fourths of the length, as compared to twenty-one-twentieths only in the average specimen measured by S. Weller (1914, p. 483).

COMPOSITA BROWN

C. trinuclea (Hall)

S. Weller's (1914, p. 486; 1920, pp. 354, 361) conception of this species is here followed. Its high variability, as pointed out by that author, is fully confirmed by the material from Crane which includes most of the various forms illustrated in Weller's (1914) plate 81. The hypotype (A.M.N.H. No. 26191/1:1) is closely reminiscent of the "very perfect specimen" shown in his figures 16-20 of that plate; another fine shell from quarry "II" (A.M.N.H. No. 26191/1:2) of that shown in his figures 25, 26; still another (A.M.N.H. No. 26191/1:3) of the comparatively large shell represented in Weller's figures 31-34, as is a shell from quarry "I" (A.M.N.H. No. 26191:2). Still another specimen from the latter locality (A.M.N.H. No. 26191:1) closely resembles the narrow form illustrated in Weller's figures 35 and 36, whereas a few smaller shells from quarry "II" (A.M.N.H. No. 26191/1:4-6) stand out by being unusually wide. Some more, rather small individuals from quarries "I," "II," and "IIb" (A.M.N.H. Nos. 26191:3, 26191/1:7, 8, 26191/2) represent the more delicate form illustrated by Weller's figures 27-30.

r *C. subquadrata* (Hall) (A.M.N.H. No. 26192)

A single shell, attaining 21.3 mm. in length, 20.6 mm. in width, and 12.1 mm. in thickness, resembles in its size as well as in its shape so closely the specimens referred by S.

Weller (1914, p. 489, pl. 81, figs. 1-15; 1920, p. 375, pl. 11, figs. 12-14) to the true *C. subquadrata*, especially those illustrated in plate 81, figures 9-11, and plate 11, figures 12, 13, that it has to be assigned to that species, despite Weller's tendency (1920, p. 375) to restrict it to the Upper Chester. However, the boundary between *C. trinuclea* and *C. subquadrata* appears to be a fluent one. The specimen here dealt with may well be one of those which, in Weller's (1920, p. 354) words, "are intermediate in character between any of the groups that may be recognized."

r *C. laevis* S. Weller

Represented by a single individual.

r *C. spec.*

PELECYPODA

CANEYELLA GIRTY

C. ? spec.

On the strength of its resemblance to some of Girty's (1909, pl. 3) figures of his *C. wapanuckensis*, especially figures 8 and 10, the only pelecypod from Crane, rather poorly preserved and measuring about 9 mm. in length, is tentatively identified as above.

GASTROPODA

PLATYCERAS CONRAD; SUBGENUS ORTHONYCHIA HALL

c *P. (O.) spec.*

STRAPAROLUS MONTFORT; SUBGENUS EUOMPHALUS SOWERBY

r *S. (E.) planidorsatus* Meek and Worthen?

r Bellerophonitid gastropod

r High-spired gastropods, somewhat reminiscent of *Ceraunocochlis* Knight, gen. and spec. indet.¹r High-spired gastropod (cf. *Ceraunocochlis* Knight), or echinoid spine?

¹ For determination of these gastropods and valuable suggestions for that of some of the others and of the specimens here doubtfully referred to *Spirorbis annulatus* Hall, I am greatly indebted to Dr. J. Brookes Knight, of the United States National Museum.

Differs from the high-spired gastropods listed above, which attain heights of from 3 to 5 mm. only, chiefly by its much larger size, attaining about 15 mm. in height.

r Gastropod, gen. and spec. indet.

Also small (may have reached a height of 6 or 7 mm.), but generically different from those listed above.

r Gastropods, gen. and spec. indet.

Of similarly small size.

TRILOBITA

KASKIA J. M. WELLER

K. chesterensis S. Weller and J. M. Weller (= ? *Phillipsia stevensoni* Meek)

Except for one poorly preserved but complete individual, the nine specimens present are pygidia only. I wish to extend my thanks to Dr. J. Marvin Weller of the Illinois State Geological Survey for his identification of this form. In a letter dated Urbana, March 6, 1945, Dr.

Weller repeats the view, previously stated in his paper on Carboniferous trilobite genera (1936, p. 710), that *K. chesterensis* might be a synonym of *Phillipsia stevensoni*. As a matter of fact, pygidia from Pennsylvania and Alabama, labeled *Phillipsia stevensoni* Meek in the collections of the American Museum of Natural History (two of them from the Hall collection, the others presented by Prof. J. J. Stevenson), are indistinguishable from the Crane specimens, as are those given by the same donor to Walker Museum from J. M. Weller's types (see Weller, 1936, p. 711). In his letter, quoted above, he believes conspecificity of "*Phillipsia*" *stevensoni* and *Kaskia chesterensis* even to be probable, but he hesitates to replace the latter specific name by the former because Meek's species has never been adequately described and figured, and the types cannot be located.

Pygidium of an indeterminate trilobite

STRATIGRAPHICAL CONCLUSIONS

If the present faunal list is compared with Ulrich's (1917, pp. 226-230) of the Glen Dean formation, which seems to be so far the most complete one given for that formation, it cannot be surprising that Ulrich's list, covering "four collections taken from as many widely separated places in Kentucky" and including for the sake of correlation western Illinois, enumerates many more forms (altogether 162) than the Crane list which deals with one limited area and includes altogether 86 forms.

On the other hand, if slight differences as indicated by a "cf." preceding, or a "var." following the specific name are neglected on either side and if the small gastropods from Crane which could not be reliably determined even as to their generic affinities are left out of account, the names listed above are, with comparatively few exceptions, found in Ulrich's list as well.

Most of these exceptions are, however,

not real ones: Ulrich's "*Zaphrentis spinulifera*" is merely a synonym of *Triplophylites spinulosus*. My varieties of *Pentremites spicatus* are mentioned though not named in Ulrich's paper of 1917. *P. lyoni*, var. *gracilens* Ulrich is not included in his list, but this variety is recorded by him (1917, p. 263) "from either the Golconda or the Glen Dean limestone in. . . Kentucky." The form listed above as *Tholocrinus* spec. is very closely related to, if not at least in part (see p. 2, footnote 1) identical with, *T. wetherbyi* (Wachsmuth and Springer), which is in turn merely Kirk's (1939, p. 471) new name for *Hydriocrinus wetherbyi*, listed by Ulrich under No. 41. *Linoproductus ovatus* does not appear in Ulrich's list, but *Productus pileiformis* does, which is, according to S. Weller, a synonym of the former. *Composita trinuclea* is another form not explicitly listed by Ulrich, but according to S. Weller

(1920, p. 375) it might well be hidden under his *C. subquadrata*.

Furthermore, Ulrich's "*Spirorbis* sp." may well be considered the equivalent of my *Spirorbis annulatus* Hall ?, as may his "*Phillipsia* sp." be that of *Kaskia chesterensis* and, perhaps, his "*Anisotrypa* n. sp." that of my *A.?* spec.

Six more of the names listed above but not found in Ulrich's list can be disposed of thanks to the fact that they are recorded elsewhere from the Glen Dean. *Pentremites okawensis*, a species established only after 1917 by S. Weller (1920, p. 358) on a form occurring in the Glen Dean as well as in the Golconda, is recorded also by Butts (1926, p. 198) from the Glen Dean horizon (see also J. M. Weller, 1931, p. 286). *Zeacrinites wortheni* is stated by Springer (1926, p. 82) to be a crinoid "from the . . . Glen Dean of Kentucky and Okaw of Illinois." *Archimedes lativolvis* Ulrich (1905) is, according to McFarlan (1942, p. 441), "rather common in and characteristic of the Golconda," but it "has also been recognized, though it is not common, in the Paint Creek and the Glen Dean." *Orthotetes kaskaskiensis* appears in S. Weller's (1920, p. 196) faunal list of the Glen Dean, though not in Ulrich's. *Composita trinuclea*—even should it not be covered by Ulrich's listing of *C. subquadrata* (see p. 7 and above)—occurs, anyway, according to S. Weller (1920, p. 361), "in abundance in the Golconda and Glen Dean faunas in Hardin County and elsewhere, wherever these formations are well exposed." Finally, *Caneyella wapanuckensis*, to which the only pelecypod from Crane appears to be closely comparable, is recorded not only by Girty (1909, p. 35) from the Caney shale of Oklahoma, but also by Butts (1926, p. 200) from the Floyd shale of Alabama which is correlated by him (*ibid.*, p. 204) with "either Gasper or lower Bangor (Glen Dean)."

Thus, of all our forms seemingly or really missing in Ulrich's list there remain only three that to the best of my knowledge have not yet been explicitly recorded from the Glen Dean formation. The stratigraphic range of two of them, *Stenopora cestriensis* Ulrich and *Composita laevis* S.

Weller, is given by their authors (Ulrich, 1890, p. 442; S. Weller, 1914, p. 492) as "Chester group" without any more precise indication of the horizon. The same holds true of *Archimedes meekanoides* McFarlan, as far as Condra and Elias (1944, p. 126) are concerned. McFarlan himself (1942, p. 442), however, states his species to be "common in the Renault and Paint Creek formations," but it is certainly not surprising to find a *Chester Archimedes* one or, as in the present case, even two (limestone) formations above those of its greatest abundance.

Thus the paleontological evidence, as documented by the above faunal list, fully confirms the assignment of the fossiliferous limestones of Crane to the Glen Dean formation. This result is still corroborated by the fact that these limestones are conformably overlain by a plant-bearing sandstone which cannot be anything else than Tar Springs sandstone, the earliest Pennsylvanian being separated throughout that region by a "marked unconformity" from the Chester (J. M. Weller, 1931, p. 266; McFarlan, 1943, p. 96).

The agreement with the Glen Dean faunas of adjacent areas is, however, not nearly so perfect with respect to the most common forms which might serve as index fossils. Of the forms marked "c" in the above list only *Petremites lyoni* and *Eridopora macrostoma* are granted "a high practical value as guide fossils" by Ulrich (1917, pp. 224, 226, 227), and *Pentremites spicatus* is recognized as characteristic of the Glen Dean formation by S. Weller (1920, p. 197) and J. M. Weller (1931, p. 263). On the other hand, *Prismopora serrulata*, not included in his "starred" forms by Ulrich (1917, pp. 224–225) merely because it is found also, though rarely, in the Gasper limestone, called the most important index fossil of the Glen Dean limestone by S. Weller (1920, p. 196), J. M. Weller (1931, p. 263), and Butts (1926, p. 200), and stated to be particularly useful also by McFarlan (1943, pp. 30–31), is rather poorly represented (by about half a dozen specimens) in the Crane area. There is no trace to be found of the "*Prismopora gardens*" emphasized by S. Weller (pp. 197, 374).

Even much rarer in the fauna here dealt with is *Archimedes latus*, considered another characteristic Glen Dean fossil by all the authors quoted above. A single short fragment from Crane may be referable to this species. Another bryozoan, considered by McFarlan (1943, p. 91) "the most consistent and at the same time [an] abundant" Glen Dean fossil, *Cheilotrypa hispida* Ulrich, is entirely missing at Crane, as are the crinoids distinguished by their wing plates, *Pterotocrinus bifurcatus* and

P. acutus, both granted index fossil rank by Ulrich (1917, p. 227) and J. M. Weller (1931, p. 263) and the former by S. Weller (1920, p. 197) also.

An attempt to investigate how far these differences in the abundance of certain guide fossils are due to variations in ecological conditions, as expressed in facies differences between various exposures of the Glen Dean formation, might well be worth while.

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